Interface Oscillation in the Side-by-Side (SBS) Tape Casting of Functionally Graded Ceramics (FGCs)

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Interface Oscillation in the Side-by-Side (SBS) Tape Casting of Functionally Graded Ceramics (FGCs) MASOUD JABBARI, Department of Mechanical Engineering, Technical University of Denmark, REGINA BULATOVA, Department of Energy Conversion and Storage, Technical University of Denmark, JESPER HATTEL, Department of Mechanical Engineering, Technical University of Denmark, CHRISTIAN BAHL, Department of Energy Conversion and Storage, Technical University of Denmark — Room temperature magnetic refrigeration is a new highly efficient and environmentally protective technology. Although it has not been maturely developed, it shows great applicable prosperity and seems to be a potential substitute for the traditional vapor compression technology. Tape Casting is a common process in producing multilayer ceramics, which now is used for producing side-by-side (SBS) functionally graded ceramics (FGCs). These FGCs are mostly used in the magnetic refrigeration sectors due to the varying composition of the magnetocaloric materials so that the magnetic transition temperature of the magnetic regenerator varies along the paths. The main goal of this research is to study the multiple material flow in SBS tape casting and analyze its influence on the interface between the stripes. The materials used for the experimental part are $La_{0.85}Sr_{0.15}MnO_3$ and $Ce_{0.9}Gd_{0.1}O_2$ ceramic slurries. The rheological behavior of the slurries are extracted from experiments and used in the ANSYS FLUENT commercial code to develop a fluid flow model for the non-Newtonian ceramic slurries and evaluate the interface oscillation between the stripes in SBS tape casting. The Numerical results show reasonable agreement with corresponding experimental results.

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